

Transcript for **Black Holes**

Near a black hole, space and time do some very strange things because black holes are probably the most violent places we know of in the universe. This river provides a beautiful analogy for what happens to space and time as you get closer and closer to the black hole.

Now upstream, the water is flowing pretty slowly. Let's imagine that it's flowing at three kilometres per hour, and I can swim at four. So, I can swim faster than the flow and can easily escape.

But as you go further and further downstream towards the waterfall in the distance, the river flows faster and faster.

Imagine I was, er, decided to jump into the river just there, on the edge of the falls. The water is flowing far faster than I could swim. So, no matter what I did, no matter how hard I tried, I would not be able to swim back upstream. I would be carried inexorably towards the edge and I would vanish over the falls.

Well, it's the same close to a black hole because space flows faster and faster and faster towards the black hole. Literally this stuff, my space that I'm in, flowing over the edge into the black hole. And at the very special point called the event horizon, space is flowing at the speed of light into the black hole. Light itself, travelling at 300,000 kilometres per second, is not going fast enough to escape the flow, and light itself would plunge into the black hole.

Well, as you fall into a black hole, across the event horizon, then if you were going feet first, your feet would be accelerating faster than your head, so you would be stretched and you would be quite literally spaghettified.

Now, as you get right to the centre, then our understanding of the laws of physics breaks down. Our best theory of space and time, Einstein's Theory of General Relativity, says that space and time become infinitely curved, that the centre of the hole becomes infinitely dense. That place is called a singularity and it is the place where our understanding of the universe stops.